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## **Preliminary survey of lamb losses (black loss) in Highland sheep flocks**

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Title: A preliminary survey of lamb losses (black loss) in Highland sheep flocks

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**Abstract:**

High levels of lamb loss have implications for the sustainability of hill sheep enterprises. A questionnaire survey was used to estimate the viable, healthy, mark to wean lamb loss on 40 Scottish Highland farms in the 2011 to 2012 lambing season. An average loss overall of about one in twenty (animal level 6.6%; flock level 6.2%) masked the wider range. A more detailed study of five holdings using electronic identification tags produced higher estimates of about one in five (animal level 18.6%; flock level 8.4 – 25.8%). Reasons for such heavy losses need further investigation, as they represent not only an animal health and welfare challenge but may contribute to environmental and social issues too.

## Short communication

The sustainability of British sheep farming is dependent on the sale of lambs to provide income. The percentage of lambs reared is affected by losses at different stages in the sheep year cycle. Contributory factors for neonatal and perinatal lamb mortality in sheep are well researched (Dwyer and others 2016, Nowak & Poindron 2006, Binns and others 2002, Haughey 1991) and major causes of subsequent post-natal losses in lowland and upland flocks are well-known. For some, reduction of losses can be achieved through appropriate management and preventive health strategies. In the hills, the extensive nature of the production system combined with comparative remoteness and inaccessibility makes both quantifying losses and identifying potential causes more challenging. This hampers our ability to determine how such losses can be reduced. In the period 2010 to 2013, annual lamb mortality estimates for Scottish, Less Favoured Area, hill, breeding flocks varied from 7% to 17%. These estimates were derived from purebred Blackface and Cheviot flocks (Anon 2013, Anon 2015; number of flocks was less than 30). Our preliminary investigation aimed to explore the level of losses experienced by a wider population of sheep farmers in the Highlands and Islands areas of Scotland.

There were two components: firstly a questionnaire survey and, secondly, a more detailed study of five holdings. A brief one page questionnaire was sent to sheep-producing clients from six SAC Consulting Farm and Rural Business Services (FRBS) Highland offices, in April 2011. For the 2011 lambing season, it requested: the number of ewes – scanned in lamb, marked (i.e. at return to hill after lambing), at shearing and at weaning; the number of lambs – at scanning, marking, shearing and weaning; the main breed of ewe and ram, and the number of female sheep sent to the ram in autumn 2010, plus any additional comments.

Forty-one flocks responded. Almost half (n=19) either did not scan, or did not provide numbers for ewes and lambs at scanning, therefore total losses could not be estimated. A quarter (n=10) did not provide either lamb, or ewe, or both, numbers at shearing. Three did not provide numbers of ewes at weaning; however, two of these provided numbers of weaned lambs, so lamb losses from marking to weaning were estimated for 40 flocks i.e. the loss of live lambs that were healthy, viable and set to be turned out to the hill. The average mark-to-wean, viable, lamb loss overall on an animal basis was 6.6% (95% confidence interval, exact binomial 6.3 – 7%) i.e. the per cent of (number of all lambs that were marked in the 40 flocks minus the number of all lambs that were weaned in the 40 flocks) divided by the total number of lambs that were marked in the 40 flocks. The average flock level loss was 6.2% (Table 1). Reasons given for losses included: foxes, ravens and hooded crows (*Corvus cornix*), eagles (sea and golden), ticks, open drains, yellowsees (plochteach), possible theft and 'braxy' (*Cl. septicum*).

The five detailed study holdings were not included in the survey. In 2011 and 2012, lambs on these five holdings had electronic identification (EID) tags inserted at two to three weeks of age. The tags were re-read: as the lambs left the holding; entered the replacement breeding flock; were retained on the holding, or were found dead. The difference between the numbers inserted and re-read is an estimate of the 'unaccounted for' or 'black' loss of healthy, viable lambs. On a flock basis, this ranged from 8.4 to 25.8%, with an overall animal level loss across both lambing seasons of 18.6% (Table 2).

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These quantitative estimates for the average ‘black loss’ of lambs at flock level, in Scottish Highlands and Islands flocks in the 2011 and 2012 seasons, vary. On the EID study farms it was just under one in five whereas, in the survey flocks, it was just over one in twenty. The higher values for the EID flocks are possibly due to the selection process; those with a known issue, willing to participate in a more detailed investigation, in the hopes of determining root causes. When hill sheep are gathered for these specific events; all the flock may not return, or there may be acquisitions from neighbouring flocks. The technology used on the EID farms and the semi-prospective nature of the survey should have reduced any tendency to miscount, or under-estimate, numbers. Anecdotally, survey feedback was considered to be generally good with some geographical differences. Any potential response bias, due to subject interest, or existing problems, could not be assessed, although the lower number of responses at offices with lower flock level losses may reflect this. Ideally studies would be conducted over a number of years to ensure that the losses observed are not solely down to time-dependent issues, such as a bad winter. This might have been a contributory factor in the 2012 season; yet there was no apparent seasonal difference in the EID study (Table 2). Whatever the reasons, the high end losses are substantial and have the potential to make a hill sheep enterprise economically unsustainable. A lack of alternatives for income generation increases the risks of land abandonment and associated environmental and social changes (SAC 2011, SAC 2008).

The published average lamb loss estimates for the period are birth to rearing losses (Anon 2013, Anon 2015) and, therefore, should be higher than the estimates obtained in these two studies. This highlights the difficulty in being able to define a suitable measurement that is standardised and comparable across flocks and studies, due to the variance in management systems within sheep sectors. It will be exacerbated if attempts are made to compare losses between sectors, or countries.

True ‘black loss’ of lambs is a subset of healthy, viable lamb losses in the marking to weaning period; the ones for which the causal reasons are unknown. In order to reduce black loss, improve technical efficiency and thus economic sustainability, the causes need to be elucidated. The survey farmers report potential reasons for losses that mostly focus on observable causes. In the terrain, conditions and management systems that these sheep live it is difficult to investigate causes, especially when resources available for investigations are low (e.g. labour). If the issue of ‘black loss’ is to be adequately addressed other, possibly novel, methods need to be found. Exploration of differences between farms at either end of the spectrum of losses is one avenue for investigation. Another possibility is to use new technologies to detect, find, recover or view ‘lost’ lambs in situ. Previously post-mortem investigation has been compromised by the inability to recover carcasses within a suitable time period and so there is a grey area in the definition of ‘black loss’. In Norway satellite data services are being used to geo-fence sheep, to track them to determine grazing patterns and to reduce predator attacks (Anon, 2016). Whether this and/or the use of unmanned aerial vehicles would be suitable for the Scottish Highlands requires further investigation.

Table 1: Descriptive results from the forty useable questionnaires

		Number of female sheep that went to the ram per flock	Viable Lamb loss (mark-wean) at flock level* %
FRBS Office	Number of Flocks	Mean Min - Max	Mean Min - Max
Lewis	10	98 28 - 332	5.0 0 - 14.3
Campbelltown	7	723 272 - 1925	5.2 0 - 22.8
Thurso	4	312 175 - 596	1.3 0 - 3.3
Inverness	1	475 n/a	3.7 n/a
Skye	7	575 244 - 842	7.2 0.9 - 10.5
Oban	11	934 87 - 2350	9.2 0 - 41.4
Overall	40	552 28-2350	6.2 0 - 41.4

i.e. the per cent of (the number of lambs in an individual flock that were marked minus the number of lambs in that flock that were weaned) divided by the number of lambs in that flock that were marked

Table 2: Summarised results from the five EID detailed study holdings

	Number of lambs (%)		
	Tagged	Retrieved from dead lambs	Lamb tags unaccounted for*
Overall (animal level) 2011/12	2056	34 (1.7)	400 (19.5)
Overall (animal level) 2012/13	3007	39 (1.3)	541 (18.0)
Overall (animal level) both seasons	5093	73 (1.4)	941 (18.6)
Flock level range for 2011/12; min to max	233 - 600	2 - 10 (0.3 - 1.7)	31 - 135 (10.5 - 22.5)
Flock level mean 2011/12			(19.4)
Flock level range for 2012/13	201 - 1503	3 - 17 (1.5 - 2.6)	29 - 348 (8.4 - 25.8)
Flock level mean 2012/13			(15.6)
Flock level range across both seasons	201 - 1503	2 - 17 (0.3 - 2.6)	29 - 348 (8.4 - 25.8)
Flock level mean across both seasons			(17.4)

\*estimate of black loss

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